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National Imagery and Mapping Agency Mapping, Charting, and Geodesy Utility Software Environment (NIMAMUSE) Fusion V2.1 Test Plan and Test Results

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13. ABSTRACT *(Maximum 200 words)*

   NIMAMUSE Fusion V2.1 is a computer mapping software program produced by the Naval Research Laboratory for the National Imagery and Mapping Agency (NIMA). In addition to demonstrating the NIMA digital map data products, coordinate conversions, and datum transformations, Fusion provides general purpose mapping capabilities for managing user data, route planning, and route monitoring. This report describes a series of tests to determine how well Fusion V2.1 meets its functional requirements and presents the results of performing the tests.

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NIMAMUSE Fusion V2.1 Test Plan and Test Results

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1 INTRODUCTION

The National Imagery and Mapping Agency (NIMA) has developed the NIMA Mapping, Charting, and Geodesy Utility Software Environment (NIMAMUSE) to provide utilities for access to NIMA digital map data products and to perform standard datum transformations and coordinate conversions. Fusion is one of the major applications in NIMAMUSE. It produces digital maps by fusing vector and raster map data layers together. A single raster map serves as a base layer, while user-selected vector features in other layers are overlaid on this base. A user-designed annotation layer can also be laid on the constructed map. After all layers of the map are assembled and crafted to the desired appearance, Fusion freezes the layers together into a new, single raster map object that can be printed, or saved to a file for distribution or for use as input into other applications.

2 OVERVIEW

The requirements for the application program Fusion are described in the NIMAMUSE Fusion 2.1 Software Requirements. This report describes a series of tests to determine how well Fusion meets its requirements on the various computer platforms. The tests were actually performed by the same people that developed the software. Test equipment and preparations are described so that the tests can be duplicated by others.

Section 3 describes the preparation of hardware and software needed before testing is started.

Section 4 contains guidelines, both general and specific, for properly performing test procedures.

Section 5 is a chart containing the functional requirements, the steps needed to test Fusion's support of that requirement, the expected results after each step is taken, and the actual results.

Section 6 contains a summary of the results, including a list of bugs found.

Section 7 presents the major conclusions of the evaluation, based on the test results.

3 TEST PREPARATIONS

Fusion is designed to be loaded on to and run from IBM PC's running Windows95 and Windows NT, Sun, Solaris, Hewlett-Packard, and Silicon Graphics computers. Fusion should also run on the Win32s PC platform, but this was not tested. The tester should install the Fusion program and tutorial data from the NIMAMUSE web site http://www.nima.mil/geospatial/SW_TOOLS/NIMAMUSE/ onto the desired computer platforms.

Testers who are unfamiliar with the program should work through the tutorials in the Fusion User's Guide. Although some Test Procedures parallel the operations in the Tutorials, the latter are more detailed and self-explanatory.

The tester should also have NIMA digital products available. Finally, it would be useful to use the

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NIMA Raster Importer and Vector Importer programs to create new test files.

4 TEST DESCRIPTIONS

This section contains guidelines for conducting tests. General guidelines that are applied to most tests are listed first. Special instructions for tests of specific functional requirements are given next.

4.1 General Guidelines

The software should already be running before the start of each test, except where noted. The Stability Requirement should be monitored in every test procedure; that is, any error termination should be recorded.

The correctness of displayed maps should be monitored often, not just during the test procedure for a specific Map Data requirement. The tester is encouraged to use additional references and test files, other widely-used mapping programs, personal knowledge, etc. to judge the appearance and accuracy of displays. This is especially true of the requirement "Constantly display cursor position, program status, and data (when applicable)". The geographic location of the cursor and the abbreviation for the current datum should be accurately displayed in the left side of the status bar for all types of maps, with the single exception of a temporarily unregistered TIFF image. Timely and useful messages describing the current state of the program, or prompts for needed actions, should be displayed in the right side of the status bar. Note that the map window should be made large enough for this information to be displayed.

The Functional Requirements to be tested are listed, but not fully described, in the table of test procedures. See the Software Requirements document for complete descriptions of functionality. Some procedures do not precisely specify all the parameters of a test. For example, if there are many possible combinations of settings, test files, etc., the procedure may not specify exactly which combinations, or how many, to test. The tester is encouraged to test as many as feasible. Rate all tests as pass/fail except where noted in Special Instructions. If a test is passed, but actual results differ slightly from expected results, differences should be noted. If a test fails, the reason for failure should be described as completely as possible.

A test may be redundant because it has already been performed in another sequence as part of setting up for the test, etc. The description of results for the test can simply refer to the results from the other sequence.

4.2 Special Instructions

Some tests have special instructions regarding test preparation, platform-dependent behavior, description of results, or test rating. These instructions are listed below. Each sequence number matches that of the corresponding procedure in the Test Procedures section.

5.1 Map Document Files
5.1.1 Create new map
5.1.1.2 Open multiple new map windows up to user-entered maximum or memory limit.
Current setting for maximum maps may be too large to conveniently do test. Change setting as described in "Select maximum number of map windows".
5.1.2 Open and view existing map

5.1.2.3 Multiple map windows up to user-entered maximum or memory limit.
Current setting for maximum maps may be too large to conveniently do test. Change setting as described in "Select maximum number of map windows".

5.1.2.5 Open maps created on other NIMAMUSE-supported platforms (portable maps).
Fusion creates binary map documents that should be completely portable; that is, a "*.map" file created on any supported platform should be playable on any other platform. If more than one supported platform is available for testing, the tester should create a map on each available platform and open it on at least one other platform.

5.2 Map Data
5.2.1 Add, modify, or remove a map background file
5.2.1.3 Change or remove raster background while maintaining same set of vector overlays
Be sure that the map extents of the overlay files at least partially overlap the map extents of the raster files, or the overlays will not appear. For example, if the new raster background has an entirely different geographic location than the first raster file and the overlay file, the overlay will seem to disappear when the background is changed, even though the program is operating correctly.

5.2.1.4 Import and register TIFF images
Make sure the current map display coordinate system matches the display system of the TIFF file BEFORE importing the image. This is usually the default WGS84/GP system. Select Settings/Map Cursor/Style/Plus, since this style allows the greatest accuracy when clicking on map corners to register image. Images are not warped, reprojected, resampled, or rotated. NOTE: The Fusion program is not intended to be a sophisticated TIFF reader. It is to be expected that there are some TIFF formats that the program can not import.

5.2.2 Access Raster Products
When a raster product is added to a map, the following "behind-the-scenes" changes may be made to the map geometry:

Map Display Coordinate System -- In the current version of the program, all raster data products are assumed to be on the WGS84 datum, and the Map Display Coordinate System is changed accordingly (if necessary).

Map Scale -- Raster products look best at a scale for which there is a pixel-to-pixel correspondence between the raster product and the map display. This is the default scale when the map is first drawn with the "Use Product Scale" option. Since pixel size on the screen is probably different than pixel size in the original data product, the new scale may be different than expected.

ARC system – Most maps are adjusted to the equal Arc second Raster Chart/map (ARC) system. See MIL-A-89007, "ARC Digitized Raster Graphics" for a description of the ARC system. Exceptions are those that use one of the projection coordinate systems as their Map Display Coordinate System, and those with raster file backgrounds. When a raster product is added to a map at the default product scale, the ARC system is not imposed on the map by Fusion, but the resulting map may conform to the ARC system because ARC is part of the product specification (e.g. ADRG and CADRG). The next section describes how the map geometry is set up when the "Choose Scale" option is selected before the initial import of data, and how it may be changed by Location operations after the initial import of data.

5.2.2.3 Use program's standard location functionality to relocate raster product maps.
Most of the operations in the Location menu will cause a map that has a newly-imported raster product to stop using the default raster product scale. The pixel-to-pixel correspondence between the raster product and the map display will not be maintained. This means that although the map may no longer have the optimum scale for viewing, it can be forced to have the exact scale desired by the user. Also, the ARC system will be imposed on the new map geometry. This means that maps with different data products can be forced to have identical map geometries. The default product scale can be restored in two ways:
1. Select Location/Raster Zoom Reset.
2. Select Location/Raster Browse Map and click on "Use Product Scale" in the Product Area Reset Dialog.

5.2.4 Add, modify, or remove a UTM Grid.
In the current version of the program, all raster background files and data products are assumed to be on the WGS84 datum. Furthermore, the Map Display Coordinate System can not be changed when the map has a raster background. But some digital map data was created by scanning maps on other datums. Although the data may have been warped to the WGS84 datum, the grid lines and labels were not necessarily redrawn. For this reason, grid lines and MGRS 100,000-Meter Square Identifications drawn on top of the map may not match those that are

embedded in the raster data. Grids originally drawn on the Bessel 1841, Clarke 1880, and Clarke 1866-NAD ellipsoids use a different lettering scheme than WGS84, and the Clarke 1866 ellipsoid is a very common one in data products. Program accuracy can be tested by changing the Map Cursor Coordinate System to "Military Grid Reference System | NAD27" and determining if the cursor readout matches the embedded lines and labels better than the overlay grid. See Appendix B, Figures B-3 and B-4 of DMA TM 8358.1.

5.2.5 Add, modify, and remove vector overlay files.

Overlay files may be either ASCII or binary. Use Settings/Vector Overlay to set the format BEFORE opening or saving files. ASCII files do not preserve symbology (symbol shapes and colors).

5.2.6 Add, modify, or remove a RDBMS query to ODBC data sources (Win32 only)

Sources are configured using the ODBC Administrator program (not a NIMAMUSE component) (WIN32 Only). See Tutorial 7 in the Fusion 2.1 User's Guide for how to configure an ODBC data source. This capability provides the means of interacting with user data from a NIMAMUSE map. Testing should include at least one data source having a "Draw" query, like Tutor7.

If files from Tutorial 7 are used in testing, make sure that the current map extents include the Norfolk area (from about 36.75, -76.8) to (37.25, -76.3), or data will not show up.

5.2.6.11 Provide text edit form for displaying/modifying data record attributes of a RDBMS data record.

Form is either read-only or editable--see "Select settings for RDBMS. "

You can change the attributes displayed in the form, with a special "form query" that determines which columns from the data tables to show. Uncomment the FORM_QUERY line in "queries.txt" or add/edit a form query in a file of your own queries.

5.2.6.12 Support RDBMS route planning by automatically redrawing line segments and renumbering waypoints after route is edited.

A "Route" is a table in which each record is a waypoint. Use the "route1" table from the test file "route.map" , or create a new table of waypoints.

5.2.7 Add, modify, or remove views of VPF products

5.2.7.1 When adding VPF view, locate Database Header Table (dht) file via standard GUI open-file dialog.

The DHT file sits atop every VPF database. If the current map does not yet have any VPF data, the menu item Data/VPF View/Add will be available to add the first database. After data is added, additional databases can be added by selecting Data/VPF View/Modify to display the Feature Selection window and then pushing the Add button next to the Database list button. On some systems you must press the Add button to get the prompt for the dht file when adding the first database.

5.2.7.3.11 Create new VPF theme and add to list.

The theme table is initialized with the selected coverage's feature classes; that is, themes are initially equivalent to the feature classes. A feature class can be used as the basis for creating additional themes which are subsets of the feature class, via the Theme Properties window. Press the Add Theme Control button. This will invoke the Theme Properties window, initialized with the properties of the first feature class of the current coverage. The Theme Properties window includes list buttons for viewing or choosing the database, library, coverage, and classes, an Expression Builder feature for changing the default expression ("*"), a control for naming the new theme, and a symbology control. When the OK button is pressed, the new theme will be added to the theme table for the database, library, and coverage selected in the Theme Properties window.

5.2.7.3.12 Modify existing VPF theme.

A selected feature class can be modified, i.e. replaced with a theme that is a subset of the feature class, via the Theme Properties window. Highlight the line for the desired class in the theme table and then press the Modify Theme Control button, or double-click in the Description:Expression column, to invoke the Theme Properties window. In the Theme Properties window, only the Description, Expression, and Symbology controls will be enabled.

5.2.7.7 Reload all VPF components, clipping to extents of current map.

The primary purpose of this requirement is to enhance performance by removing data for geographical areas that are no longer of interest. Start with a large map. Select Settings/VPF View/ 1.0X Buffer so that VPF data is not loaded for areas outside the current map. Add a considerable amount of VPF data into the view, so that it is easy to detect the loading process. Then proceed with steps in test procedure.

Note that the test procedure does not demonstrate the advantages of this functionality, only that the unwanted data has been purged. The advantage occurs when the smaller, zoomed in map is the desired map. Any later editing is

more efficient after the reload.

5.2.8 Add, modify, remove, and measure annotations

See Tutorial 5 in the User's Guide, "Annotating a Map", for mouse and keyboard actions used with annotations. In summary:

Draw straight lines by clicking on the map where line segment endpoints should be. Draw curved segments by holding the left mouse button down while drawing.

Rectangles, range rings, and polygons are collections of line features, not area features. The only way to create an area feature is to combine line features with the area aggregation tool.

To deactivate a tool, press on a different tool (including Selection tool), or hit the Escape key on the keyboard. Deactivation of the polygon tool will create a closed figure from line segments. The Escape key is also used to terminate text entry for a text feature. The right mouse button can be used to terminate line drawing or text entry.

Make multiple selections by holding down the Shift key while clicking on features or by drawing a rubber rectangle around features.

Move features by selecting and dragging with the mouse. Point features, text features, and vertices in line features (lines, rectangles, and polygons) can be moved in Select mode by typing in a new position. Hold down the Ctrl Key while clicking on the point to invoke a point entry dialog that is initialized with the current position of the point. Click near the lower left corner of text features.

Delete features by selecting and pressing the Delete key, except on the HP platform, where the Delete key functions like the Escape key.

5.2.8.8 Measure selected features

The units of measure used in display of measurements should be those currently selected via Settings/Units of Measure. The coordinate System of geographic positions should be that selected via Settings/Cursor/Coordinate System.

5.2.8.9 Spatial query for VPF features.

Current map should have a VPF view showing at least one point, line, and area feature. Note that feature attributes from the VPF data base are always displayed when the Spatial Query tool is pressed, but that measurements of the feature are not displayed unless Settings/Measurement/VPF Features is turned on. The latter requirement is tested in the section "Toggle display of VPF feature measurement."

5.2.9 Control input and output of data for annotation editor

Annotation files may be either ASCII or binary. Use Settings/Vector Overlay to set the format BEFORE opening or saving annotation files. ASCII files do not preserve symbology (symbol shapes and colors). Annotations from ASCII files are drawn in black with symbols that have a symbol index of 1.

5.2.10 Save map image into file format suitable for exchange with other programs.

Any existing overlays are fused into the image before it is written to file (they are not fused into the map itself).

5.3 Map Location

Test with maps that have various combinations of raster and VPF products and overlays. Most test procedures do not apply to maps with raster file backgrounds--when a raster file is present, relocation functionality is limited (see "Limit location changes when map background is from raster file"). Note also that most location operations are disabled when auto-scrolling is turned on.

In general, maps that have a GP map display coordinate system, and do not have a raster file background, are adjusted to the equal Arc second Raster Chart/map (ARC) system. See MIL-A-89007, "ARC Digitized Raster Graphics" for a description of the ARC system., and "Access Raster Products" for more specific information on the use of ARC with raster products.

During all test procedures that can expand the geographic extents of the map, be aware of the maximum extents of the map display coordinate system (see "Select map display coordinate system"). If any of the current map extents is already at a display system extent, the Zoom Out operation is disabled. If ALL of the current map extents are already at the maximum system extents, the Zoom Out Max operation is disabled. Whenever the next location operation would expand the map beyond system extent limits, a warning message should be displayed and the map should be clipped to the limits. The one exception to clipping is longitude extents with a world-wide system. Although these are represented as (-180,+180) in the window that displays system parameters, a world-wide system map should "wrap" across the international dateline if necessary. For example, it is possible to draw a map from

+150 as a western extent to -150 as an eastern extent. Latitudes for maps on world-wide systems are clipped at the poles. Only maps on the Universal Polar Stereographic grid will draw across a pole.

Where applicable, at least some test procedures should be performed with both a world-wide and a non-world-wide coordinate system. The non-world-wide system map should be tested both at a location that should produce clipping (map center is near a system extent) and at a location that should not produce clipping.

5.3.5 Reset map to maximum geographical area in one-step operation

Location/Zoom Out Max is disabled if all of the current map extents are already at the maximum system extents, if a raster background is present, or if the auto-scrolling feature is enabled.

5.3.8.1 Provide several different methods for defining map parameters.

Methods differ based on which parameters are known and which are to be computed. For example, a user may want the map to have a certain pixel size, center point and scale. He would choose the method "Center Point, Scale, and Image Size", and enter the desired values. Then the geographic extents that fit those values will be computed and displayed. On the other hand, it may be more important to the user that the map cover a certain geographical area than that it have a certain center point. In that case, he could choose the method "Geo-extent and Image Size", and then the map center and scale will be computed.

In the Map Area Configuration Dialog, controls displaying computed (dependent) variables are disabled, and controls displaying known (independent) variables are enabled. Dependent variables are recalculated each time the method is changed, the "Compute..." button is pressed, or the OK button is pressed. They are not recalculated each time a new value for an independent variable is entered.

The parameters that define the geographic extents of the map are displayed on the buttons labeled "Lower-left" and "Upper-right". They may be either "geo-extents" (first and third methods) or "corners" (second method). Geo-extents are the sides of the map. For example, entering (S10, W20) on the Lower-left button means that the southernmost latitude extent of the map will be at -10 degrees and the westernmost longitude will be at -20 degrees. Entering the same value into the same control for the second method means that the lower-left corner of the map will be at the point (-10, -20). For rectangular map display systems, these two types of extents are equivalent. Methods should be tested with both a rectangular and a non-rectangular map-display coordinate system (e.g. Lambert Conformal Conic).

Map image size is shown as both a limit and a computed size. The limit is the desired map size. Sometimes, one of the computed dimensions must be less than the limit in order to maintain the aspect ratio of the map.

5.3.12 Scroll map area by timed overlay.

The program Realtime processes the input from position sensors (GPS or NMEA strings) and creates a new output file of geographic positions every few seconds. It can be set up in Emulate mode to create an output file even if no sensors are available. Launch and configure the NIMAMUSE Program Realtime as follows: Select Setup/Port Settings from the menubar. In the Port Settings Dialog, check the COM1 checkbox, and click in the Input Column of the COM1 row. In the Port Setup Dialog, pick Emulate in the Input list. Press DONE in both Dialogs. Select the folder and file name used for the Realtime output file in the Output Setup box. Press Start. In Fusion, add "realtime.vec" to a map via Data / Overlay Files... , being sure to put a non-zero value in the timer column.

5.4 Map Settings

5.4.2 Select map display coordinate system.

Before beginning tests, remove any raster background from the map, since the system can not be changed once raster data is added.

Most of the coordinate system, horizontal datum, and ellipsoid functionality to support this requirement is supplied by the NIMA "mdtcc" library. The library controls the lists of pre-defined objects, default parameter values, validity testing, and reading from/writing to the data files "systmlst.txt", "hdatmlst.txt", and "ellplst.txt". Testing should focus on whether the Fusion 2.1 GUI properly supports the library, although any suspected problems with the library should be noted.

If the tester is unfamiliar with the predefined coordinate systems, he should spend some time examining their parameters via the Coordinate System Configuration dialog before beginning testing. In summary:

Most of the systems at the top of the list are "Geodetic Position" systems. In the Coordinate System configuration dialog, they have angular units of measure in the Coordinate Unit list button. They differ from each other by horizontal datum and system extents only. All other controls for changing system parameters are disabled when a GP system is selected.

Systems from the bottom of the list are projection-based systems. These can be recognized in the Configuration

dialog by the enabling of the Projection list button and the linear units in the Coordinate Units list. These systems are described in Chapters 2 - 4 of DMA TM 8458.1.

Changing the units in the Configuration dialog does not affect the map display. This list is used primarily when changing the map cursor coordinate system, but it is available here as a convenience, so that if cursor system is slaved to the display system, the cursor system automatically uses the desired units.

Valid system parameter values, and many of the details of Expected Results, depend on the individual coordinate system, and they can not all be described here. Some default values are arbitrary and some are mandatory.

5.4.3 Select monitor settings

5.4.3.2 Select monitor's color setting (Win32 only).

If the test computer is set up to use 256 colors, then choose "256." The effect is that certain internal software operations such as "Print" are greatly speeded up. If the computer is set up to use more than 256 colors, then choose "Other", or the display colors will be corrupted by certain operations.

5.4.4 Select Units of Measure

Add DBDB5 or DTED data to map (see "Add, modify, or remove a map background file" and "Access a raster product"). Display and record data values for some map points that will be easy to locate again. Then add one or more line and area annotations to map, and use the measurement tool to record length, area, airspace volume, and azimuth measurements for annotations (see "Add, modify, remove, and measure annotations"). Note that the Geodetic Position format in the measurement window is controlled by the Map Cursor Coordinate System, not the Units of Measure choices.

5.4.6 Set attributes for map cursor.

5.4.6.1 Select coordinate system for display of spatial position of cursor and measurement tool points.

View the parameters of the current map cursor system by selecting Settings/Map Cursor/Coordinate System and pressing "Configure New System." Note whether the current cursor position and horizontal datum displayed in status bar conform to the cursor system's Coordinate Units and Horizontal Datum controls. Press Cancel to dismiss the dialog. Add at least one annotation to map and the use the measurement tool. Note whether the Geodetic Position display conforms to the cursor system.

Select a new coordinate system and repeat the above. If the new system covers only a small part of the globe (e.g., New Zealand Map Grid), it would be best to change the Map Display System as well, since the cursor readout will give an "Out of Range" error message in all parts of the world for which the system is not valid.

5.4.8 Select terrain rendering, palette, and map resetting options for raster basemaps.

5.4.8.1 Select terrain colors for digital elevation data in color look-up table.

If unfamiliar with color wheel, hue, saturation, value, etc. review "Terrain Color Look Up Table Window" in Fusion User's Guide. Prepare for test procedures by making sure Vertical Linear units are meters, and then running cursor around on map to get estimate of map's elevation extremes (use this information when reassigning colors to data range).

5.4.13 Select method for positioning new annotations.

When Settings/Annotation/Prompt on Input is turned on, a point-entry dialog usually appears whenever the mouse is clicked on the map to add a new feature. It is initialized with the position that was just clicked. Special cases are described below for specific map tools:

Rectangle Feature Tool - Four point entry dialogs appear after all four points have been clicked. They are for entering the positions of the upper left, upper right, lower right, and lower left corners, in that order. Prompts in the dialogs tell which corner to enter next.

Range Ring Feature Tool - Two point entry dialogs appear after the circle has been drawn. They are for entering the positions of the map center and a point on the edge of the circle. The Edge Point dialog is initialized with the point on the edge where the mouse button was released.

5.4.16 Select full menu or custom menu (WIN32 only)

The Fusion initialization file "muse.ini" determines what the program menubar and submenus look like. If there is no "muse.ini" file, or if the file contains the line "custom_menu=0", the program will be launched with a Full menu. The Full menu is the default menu that is set up in Fusion's resource files and supports all the requirements in this document. If "muse.ini" contains both a section that describes a subset of the Full menu items, and the line "custom_menu=1", Fusion will be launched with a smaller custom menu.

To test the Custom Menu functionality:

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1. If no "muse.ini" exists, create one by selecting Settings/Save Settings as Defaults. If one does exist, you may want to save a copy of it before you begin to edit.
2. Open "muse.ini" in Notepad or another text editor. Change the line "save_default_menu=0" to "save_default_menu=1", save the file, and exit.
3. Make sure the edited "muse.ini" is in the same directory as Fusion and that there is no "default.map" (this would cause "muse.ini" to be ignored). Run Fusion and then Exit.
4. The line "save_default_menu=1" told Fusion to write out a file called "default.men" which contains a description of the Full menubar, all of its submenus, and the items within those submenus. "muse.ini" can now be edited to create a custom menu by pasting in lines from "default.men".
5. Change "muse.ini" as follows: Change the save_default_menu setting back to '0' and change the custom_menu setting to '1'. Copy the top two lines from default.men into the bottom of "muse.ini". The first line, "[Menu_fusion]", is the section heading. The second, "top_menus=6", indicates that there are six main menu items (File, Data, Location, Settings, Help, About) in the menubar. The remaining lines describe the individual menu items. Append and modify some subset of these lines following these rules:
   ♦ Each line describes a different menu item. The last digit in each line tells whether the item has a submenu, and how many items are in the submenu. '0' means there is no submenu; that is, the item is not a "parent.". For example, the menu0 line describes the File menu and ends with '11'. There are 11 items in the File submenu (New, Open, etc.). If, say, the two submenu items "Print" and "Print Setup" are not used, the last digit in the menu0 line would be decreased to 9.
   ♦ When submenu items are parents (have lower-level submenus of their own), the lines of the file are ordered in "tree" fashion. For example, menubar item Location (see the line starting with "menu85") has 15 items in its submenu. The first five of these are not parents. The sixth, "New Map Center," has a submenu with four items, and they are described in the next four lines. The seventh item in the Location menu, "Sweep Out Area" is then described in the line beginning with "menu96."
   ♦ When all desired lines have been copied in and edited, change the digits in the "menuN" fields at the beginning of each line so that they are consecutive (menu0, menu1, menu2, etc.).
   ♦ Never modify any of the numbers immediately after the equal sign. They are unique "tags" that identify the menu item to the program.
   ♦ Finally, if any of the six main menu items were not used, decrease the digit in the line "top_menus=6" accordingly.
6. An easy first test: Copy all of default.men into the end of "muse.ini". Then remove one item described near the end of the file, picking an item that doesn't have its own submenu. Renumber all the "menuN" fields in the few remaining lines, and decrease the digit at the end of the line that describes the parent item of the line that was removed.
7. Advanced testing: If the custom menu contains the menu items "Custom" and "Full" (found in the Full menu under Settings/User Menus) the program can be toggled between Full and Custom Menus. This is not part of normal program operation in the current version.
8. Although additional modifications can be made to menu items by changing other fields in "default.men," a full explanation of the proper use of these fields is beyond the scope of this document, and some fields will be reset by the program at runtime.

5.4.17 Save settings as defaults

Characteristics of current map saved into "muse.ini" and used to initialize all future maps:

1. All submenu items under Settings menu, except Map Description, Display /Colors and Raster Basemap/Look Up Table Location.

2. Image height, image width, scale reciprocal, and center point from Map Area Configuration dialog (see Location/By Dialog).

Program-wide defaults also in "muse.ini":

1. Choice of whether to display initial warning dialog on program startup.

2. Custom menu settings (see "Select full menu or custom menu").

5 TEST PROCEDURES

This section is a table of procedures that test the correlation of Fusion 2.1 with its software requirements.

The table has four columns. The requirements are listed in the first column. The second column describes the procedure(s) for testing each requirement, and the third column lists expected results for each procedure. The fourth column contains the actual test results.

The numbering sequence of the test procedures matches that of the functional requirements, except for the first digit. For example, "Create new map" is numbered 3.1.1 in the Software Requirements document, and it is numbered 5.1.1 in the table below.

5.1 Map Document Files

REQUIREMENT	PROCEDURE	EXPECTED RESULT	ACTUAL RESULT
5.1.1 Create new map			
5.1.1.1 Open new window initialized with default values on program startup.	Start program	Map window titled "map0.map" with default graticule.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.1.2 Open multiple new map windows up to user-entered maximum or memory limit.	Select File/New See Special Instructions. Then select File/New up to number in Settings/Max Maps Displayed.	Map window titled "map1.map". Can open up to, but no more than, Max Maps doc windows.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.1.3 Manipulate windows as normal for windowing system.	Resize/scroll/arrange/ focus-shift doc windows. Change various Settings menu items for one or more maps and shift focus among maps.	Normal behavior for windowing system. Menu is reconfigured to settings of map with focus.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.2 Open and view existing map			
5.1.2.1 Choice of path via standard GUI open-file dialog.	Select File/Open.	Standard open-file dialog.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.2.2 Open map document window initialized with values from file.	Open both existing and newly-created ".map" files.	Map is displayed as expected, with previous settings retained.	**Windows: PASS** **Sun:** MARGINAL: sometimes program operations corrupt map colors and colors must be restored by resizing map or by causing map to be redrawn by changing Settings. **Solaris:** same as Sun **SGI:** same as Sun **HP:** same as Sun

5.1.2.3 Multiple map windows up to user-entered maximum or memory limit.	See Special Instructions. Then open "*.map" files up to number in Settings/Max Maps Displayed.	Can open up to, but no more than, Max Maps doc windows	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.2.4 Manipulate windows as normal for windowing system.	Resize/scroll/arrange/ focus-shift doc windows	Normal behavior for windowing system.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.2.5 Open maps created on other NIMAMUSE-supported platforms (portable maps).	See Special Instructions	Maps are playable on any supported system.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.2.6 Open default map on program startup.	Restart program after copying "default.map" into bin directory.	Program opens with default.map in map window.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.1.3 Close map.			
5.1.3.1 Detect any unsaved changes to map and prompt user to save map to file before closing.	Click on unchanged map and then close it (select File/Close or click close box). Change a map and then close it.	Map window disappears. Prompt to save changes. After save, window disappears	**Windows: MARGINAL:** A few Settings changes (e.g. Symbology choice) do not invoke the prompt. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.1.3.2 Disable controls and menu items after last map closed.	Close all map windows.	Data, Location, Settings, and most File menu items are disabled. File/New, Open, and Exit menu items stay enabled.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**

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Req.	Description	Test Procedure	Expected Result	Results
5.1.3.3	Detect any unsaved changes in all open map files when program is exited.	At least one changed and one unchanged map opened; then select File/Exit.	Prompt to save changed files, then windows disappear and program terminates	**Windows:** MARGINAL: A few Settings changes (e.g. Symbology choice) do not invoke the prompt **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.1.4	**Save map**			
5.1.4.1	Save map file with current name and path (one-step operation).	Select File/Save. Check time-stamp of file.	Time-stamp should show that file was saved.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.1.4.2	Save map file with new name and path via standard GUI open-file dialog.	Select File/Save As. Check location and time-stamp of file. Close and re-open file.	Save-file dialog. Saved file exists as expected. Saved map same as original map.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.1.5	**Revert to last saved version of map, discarding changes since save.**	Save map, then change it. Select File/Revert to Saved.	Map files is read and map reverts to appearance before changes.	**Windows:** MARGINAL: Revert to Saved is not re-enabled by all Settings menu changes (e.g. Units of Measure, cursor symbol, Measurement) **Sun:** NA—not in default File menu. **Solaris:** NA—not in default File menu. **SGI:** NA—not in default File menu. **HP:** NA—not in default File menu
5.1.6	**Print map.**			
5.1.6.1	Save map image for import into non-NIMAMUSE software, including file formats TIFF, BMP, and NIMAMUSE Raster.	Select File/Print and choose each format in turn.	Dialog offering choice of TIFF, BMP, and Raster formats *.bmp, *.tif, *.ima files created as expected.	**Windows:** MARGINAL: After the first Print op, the dialog for choosing the format doesn't appear (previous format is used to initialize save-file dialog) **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows

5.2 Map Data

REQUIREMENT	PROCEDURE	EXPECTED RESULT	ACTUAL RESULT
5.2.1 Add, modify, or remove a map background file.			
5.2.1.1 Add raster background file via standard GUI open-file dialog initialized with prompt and file name to aid in selection.	Select Data/Raster File, then choose desired format.	Open-file dialog that prompts for file with proper extension.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.1.2 Read and display ADRG, ADRI, ASRP, CAC, CADRG, CIB, CRP, DBDB5, DBDBV, DTED, SRG, USRP, IMAGE, and other NIMAMUSE Raster (*.ras) file formats.	Select at least one file of each format, except TIFF (tested in "Import and register TIFF images"). Any format that is not part of the supplied test data files can be generated by the NIMA raster import program "Raster Importer".	Map is a recognizable map product image of the expected format. Color from paper products are not reproduced exactly. When file is DBDB5/DTED, status bar cursor position readout includes depth/elevation.	**Windows:** PASS. ASRP, CRP, DBDBV, SRG, USRP not tested because product samples not available. **Sun:** same as above **Solaris:** same as above **SGI:** same as above **HP:** same as above.
5.2.1.3 Change or remove raster background while maintaining same set of vector overlays.	See Special Instructions for suggested file/overlay combinations. Add overlay to map and change raster background, including different format, at least once. Select "None" at least once after a raster background has been added.	Background map changes but overlay remains. Background image disappears, but location and other data are same.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.1.4 Import and register TIFF images.	See Special Instructions. Create new map, select Data/ Raster File/ Import TIFF, and open tutor9.tif. Enter four map corners, using any embedded graticule lines as guides for cursor position. Add graticule to map.	Image appears, with prompt to enter map corner positions. "Unregistered image" message in status bar. Map is registered and cursor position is in status bar. Position matches graticule lines. Overlay graticule coincides with graticule in image within accuracy	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

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Requirement	Instructions	Expected Result	Test Results
		allowed by cursor.	
5.2.2 Access raster products.	See Special Instructions.		
5.2.2.1 Directly access these NIMA raster or image data products: ADRG, CAC, CADRG, CIB, DTED, DBDB5, MUSE Tiled GeoTIFF, and GTIFF.	Select Data/Raster Product. Find and select data file.	Open-file dialog with name of data file displayed in title bar. If enabled, Product Area Reset window appears.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS . **HP:** PASS
5.2.2.2 Provide browse map before importing raster data to aid in locating area of interest.	Choose one of top two radiobuttons in "Browse Map" box and press OK. Click center point or sweep out area, as appropriate.	Browse map showing area covered by product is drawn, and appropriate prompt is in far right portion of status bar. For ADRG, browse map is overview image included with ADRG product; otherwise, it is a graticule and world-wide vector file clipped to appropriate extents. Map is relocated as expected.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.2.3 Use program's standard location functionality to relocate raster product map after creation.	See Special Instructions. Select Location/New MapCenter/ Click on Map and click on new center. Use other Location Menu items to edit map (see "Map Location").	Data is loaded and map image with new center is generated. Map is redrawn as expected.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.3 Add, modify, or remove graticule			
5.2.3.1 Initialize new graticule with defaults based on map scale.	Select File/New, then Data/Graticule/Add.	Graticule conforms to NIMA TM 8358.1 if map scale is included there. For other scales, graticule has reasonable appearance.	**Windows:** PASS **Sun:** MARGINAL: Occasionally some line segments are missing **Solaris:** same as Sun **SGI:** same as Sun, plus degree symbols in labels can be out of place **HP:** same as Sun
5.2.3.2 Modify graticule units, spacing, color, and style.	Select Data/Graticule/Modify. Change various settings for color,	Graticule dialog. Graticule is redrawn with chosen	**Windows:** PASS **Sun:** PASS

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	spacing, and styles, and press OK. Check/uncheck boxes to enable/disable graticule components.	options. Graticule is redrawn with/without selected components.	**Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.3.3 Revert graticule to defaults based on scale after graticule is changed.	Select Data/Graticule/Modify. Click "Default" buttons.	Graticule is redrawn with default settings.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.3.4 Remove graticule when desired.	Select Data/Graticule/Remove.	Graticule disappears	**Windows:** MARGINAL: White background turns gray when grat was only data on map—map seems to disappear. **Sun:** same as above **Solaris:** same as above **SGI:** same as above **HP:** same as above
5.2.4 **Add, modify, or remove a UTM Grid**			
5.2.4.1 Display UTM grid with default spacing, colors, and labels based on map scale.	See Special Instructions. Select Data/UTM Grid/Add.	Grid conforms to NIMA 8358.1 if map scale is included there. For other scales, grid has reasonable appearance. Grid labels and boundaries are correct.	**Windows:** PASS **Sun:** MARGINAL: Occasionally some line segments are missing **Solaris:** same as Sun **SGI:** same as Sun **HP:** same as Sun
5.2.4.2 Modify color of UTM grid lines and labels.	Select Data/UTM Grid/Modify. Select a different color and press OK.	UTM Grid Color Dialog appears, with list of available colors. Dialog disappears and grid is redrawn in selected color.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.4.3 Remove UTM grid when desired.	Select Data/UTM Grid/Remove	Grid disappears.	**Windows:** MARGINAL: White background turns gray when grid was only data on map—map seems to disappear. **Sun:** same as above **Solaris:** same as above **SGI:** same as above **HP:** same as above
5.2.5 **Add, modify, and remove**	See Special Instructions.		

vector overlay files

5.2.5.1 Add vector overlay file via standard GUI open-file dialog initialized with prompt and file name to aid in selection.	Start with Settings/Vector Overlay /Binary. Select Data/Overlay Files. Press Add. Open "*.vec"file. Press OK.	Vector Overlay List window. Open-file dialog that prompts for file with ".vec" extension. File is added to overlay table. Overlay is drawn on map.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.2 Modify drawing order of multiple vector overlay files.	Repeat 2.5.1 at least once. Select an overlay. Press Up or Down button. Press OK.	New overlays are added and drawn on map in the order in which they were added. Overlays are repositioned in list and drawn in new list order.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.3 Assign and modify the symbology of vector overlay files.	Double-click on Symbol column for an overlay. Press OK.	Symbol Selection window. See "Edit Symbology". Overlay is redrawn with new symbology.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.4 Change timer value for map scrolling by timed overlay.	Double-click on Timer column for an overlay. Enter number of seconds.	Dialog for entering timer value or turning timer off. Seconds appears in Timer column. See "Scroll Map Area by Timed Overlay" for how timer value is used.	**Windows: PASS** **Sun:** PASS . **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.5 Suppress display of vector overlay without removing it from list.	Click on at least one box in Display column to uncheck. Press OK. Return to Overlay Window. Press "None". Press "All"	Only overlays with checked boxes are drawn. All boxes are unchecked. All boxes are checked.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.6 Give vector overlay file a descriptive name.	Double-click in Name column. Enter descriptive name. Press OK.	Window for entering new name. New name is used in list.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.5.7 Vector overlay files may be either ASCII or binary	Select Settings/Vector Overlay /ASCII. Add at least one ASCII overlay file and press OK.	Open-file dialog initialized with ".asc" extension, and files are added to list and drawn properly (non-default symbology is not retained for ASCII files).	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

5.2.5.8 Remove vector overlay file when desired.	Return to Overlay Window, select overlay and press "Delete". Press OK.	File is removed from list. Overlay is not drawn.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.6 Add, modify, or remove a RDBMS query to ODBC data sources (Win32 only).	See Special Instructions.		
5.2.6.1 Choose RDBMS data source from list of available data sources.	Select Data/RDBMS Query(ODBC)/Add to add new query, or Modify, to edit query that has already been added to map. Operate Databases list button. Select data source.	SQL-ODBC Databases control window appears. List of available data sources. Other controls initialized for selected data source.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.2 Display tables for selected RDBMS data source.	Operate Table list button. Select table.	List of tables in data source.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.3 Load a file of SQL queries created using any text editor.	Push "Load Query File" Choose test file "queries.txt" or other file of SQL queries.	Open-file dialog. File's queries appear in "Name" list button.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.4 Display SQL query names for data source and show query syntax for selected query name.	Operate Name list button. Select query.	List of query names. SQL Query for selected name displayed in box.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.5 Execute selected SQL query. Executing "Draw" query displays table features on map.	Push "Execute". Make sure current table has "Draw" query. Select it and push "Execute."	Query is executed. Features from selected table are drawn on map.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.6 Test connection to ODBC datasource.	Push "Test Connection".	Message stating whether connection is good or bad.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.6.7 Enable/disable map tools for editing RDBMS data source.	See "Select settings for RDBMS".		
5.2.6.8 Use program's map tools to interactively edit RDBMS data source.	Make sure "EDIT SQL" tool button is pushed. Use tool bar tools and mouse to add, select, move, delete, and change default symbology of features. See "Add, modify, remove, and measure annotations."	After each edit operation Draw Query is automatically re-executed so that map always displays contents of database.	**Windows: MARGINAL:** Symbology of existing features can be changed temporarily (changes disappear after further ops). Similarly, vertices can be moved temporarily with the new Ctrl/Click

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Requirement	Instructions	Expected Results	Status
			feature. **Sun, Solaris, SGI, HP:** N/A
5.2.6.9 Select feature types to support before creating new RDBMS table.	See "Select settings for RDBMS".		
5.2.6.10 Create RDBMS tables containing point, line, area, text, range ring, and/or waypoint features.	After selecting desired feature types in Settings menu, select Data/RDBMS Query (ODBC)/New Table. Re-select the data source in the source list. Select new table from list. Execute query. Add supported features as in "Use program's map tools to interactively edit data source."	New table appears in tables list. Map is brought to front, and map tool buttons are enabled/disabled according to menu selections. New features are drawn and database is updated to contain new features.	**Windows:** MARGINAL: Unable to draw new features for range ring or area tables. **Sun, Solaris, SGI, HP:** N/A
5.2.6.11 Provide text edit form for displaying/modifying attributes of an RDBMS data record.	See Special Instructions. Double click a feature. Click Next and Previous. Change color, style, or position (lat/lon) field in a form and press OK. Execute a "form query".	Text edit form for associated data record showing attribute names and values. View adjacent records. Changes are drawn on map. Attributes displayed in form conform to query.	**Windows:** MARGINAL: Changes made in form are not drawn until after draw query is executed. **Sun, Solaris, SGI, HP:** N/A
5.2.6.12 Support RDBMS route planning by automatically redrawing line segments and renumbering waypoints after route is edited.	See Special Instructions. Append, insert, move, and delete waypoints.	Lines and points are redrawn and renumbered.	**Windows:** PASS **Sun, Solaris, SGI, HP:** N/A
5.2.6.13 Toggle between using map tools for RDBMS Query and annotation editing.	Select "route1" table, or other table with waypoints. Press "EDIT ANO" button and use line tool to add lines. Press "EDIT SQL" button and use line tool to add lines.	Route is drawn. Lines are added as annotations and are not treated as waypoints (prompt for insertion location is not displayed and lines are not inserted into route.) Prompt for insertion location is displayed and lines are inserted into route as waypoints.	**Windows:** PASS **Sun, Solaris, SGI, HP:** N/A

Requirement	Operation	Expected Result	Test Results
5.2.6.14 Remove RDBMS query when desired.	Select Data/RDBMS Query (ODBC)/Remove.	SQL-ODBC Databases control window disappears. Map is redrawn without SQL features.	**Windows: PASS** **Sun, Solaris, SGI, HP: N/A**
5.2.7 Add, modify, or remove views of VPF products.			
5.2.7.1 When adding, locate VPF Database Header Table (dht) file via standard GUI open-file dialog.	See Special Instructions. Select Data/VPF View/Add.	Open-file dialog with prompt to select DHT file.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.7.2 When adding VPF view, display list of all libraries in selected database.	Locate and select DHT file. Select library.	Window with list of libraries in selected database. Feature Selection window described in "Configure view of VPF data" appears.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.7.3 Configure view of VPF data:			
5.2.7.3.1 Add VPF database, providing dialog to locate dht file.	Press Add button by Database list button, and select another database as above.	New database is selected in Database list.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.7.3.2 View list of all VPF databases already added to data.	Operate Database list button.	New database, and any previously added databases, are in list.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.7.3.3 Remove VPF database.	Select database and press Delete button by Database list button.	Note confirming deletion. After pressing OK, selected database is removed from list.	**Windows: PASS** **Sun: MARGINAL:** program can crash if database deleted is last one in list **Solaris:** same as Sun **SGI: PASS** **HP: PASS**
5.2.7.3.4 View list of all libraries in current VPF database already added to data.	Operate Library list button.	List of all libraries added from selected database.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS**

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Test	Action	Expected Result	Results
			HP: PASS
5.2.7.3.5 Add a VPF library, displaying list of libraries from current database that are not yet in view.	Press Add button by Library list button. Select library.	List of database libraries not already in view. Library added to list.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.2.7.3.6 Delete a VPF library.	Select library and press Delete button by Library list button.	Note confirming deletion. After pressing OK, selected library is removed from list.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.2.7.3.7 View and select from list of coverages in current VPF database and library.	Select database and library and operate Coverage list button. Select coverage.	List of available coverages. Feature classes for coverage are displayed in Theme Table.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.2.7.3.8 View and select from list containing description and expressions of themes in current VPF coverage.	Press Theme Selection button 'All'. Press Theme Selection button 'None'. Check some boxes in the Selection column to individually select themes (multiple selections are allowed). Note which themes are selected.	All theme checkboxes are checked. All theme checkboxes are unchecked. After map is drawn (see next section), selected themes are drawn as expected.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.2.7.3.9 View and modify symbology associated with each VPF theme.	Double-click in the Symbol column to edit the symbology. (See "Edit Symbology" if necessary). Modify symbology as desired and press OK. Press OK in Feature Selection window. If Reset window appears, make selections (see "Reset map area from VPF browse map") and press OK	Symbol Selection dialog appears. Dialog disappears and new symbology is displayed in Symbol column. Product Area Reset window appears if not disabled, if new library has been added, and if map does not have raster background. After map is drawn, themes and symbology are drawn as expected.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS

Requirement	Test Procedure	Expected Result	Result
5.2.7.3.10 View, select from, and rearrange drawing order of separate list containing only chosen VPF themes.	Select Data/VPF View/Modify. Make sure several area features are selected so drawing order can be easily tested. Press "Go to Drawing Order". Highlight a theme and press Up or Down. Press OK.	Feature Selection Window appears. Table with only selected themes, in order of initial selection appears. Theme is moved up or down in list. Features are drawn on map in new order.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.3.11 Create new VPF theme and add to list.	See Special Instructions. Select Data/VPF View/Modify. Select desired coverage and press Add. Edit Expression by typing new expression into box or using Expression Builder. Modify symbology. Type name for theme in Description box. Press OK. Press OK in Feature Selection window.	Theme Properties window with list buttons for databases, libraries, coverages, and feature classes lists enabled, initialized with first class in coverage. New expression is in edit box. See "Edit Symbology." New theme is added to Theme Table. New theme is drawn on map.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.3.12 Modify existing VPF theme.	See Special Instructions. Highlight theme and press Modify, then create new expression as above.	As for adding theme, except list buttons are disabled and new theme replaces existing theme.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.3.13 Delete existing VPF theme.	Highlight theme and press Delete. Press OK in Feature Selection window	Theme is removed from table. Map is drawn without deleted theme.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.4 To aid in locating area of interest, display browse map constructed from Library Reference coverages of all VPF libraries in view.	Make sure map doesn't have raster background, and that new VPF database or library has been added. Press OK in Feature Selection	VPF Product Area Reset Dialog appears.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS

			HP: PASS
	Window.	Browse map is drawn, and appropriate prompt is in far right portion of status bar. Map is relocated as expected.	HP: PASS
	Choose one of top two radiobuttons in "Browse Map" box and press OK. Click center point or sweep out area, as appropriate.		
5.2.7.5 Modify VPF View	Select Data/VPF View/Modify Modify view as in "Configure view of VPF data" and press OK.	Feature Selection window appears. Map is drawn with modified view.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.6 Display VPF feature attributes on demand	See "Spatial Query for VPF features"		
5.2.7.7 Reload all VPF components, clipping to extents of current map.	See Special Instructions for setting up test map. Select Location/Zoom In and then Zoom Out, noting time needed to draw new map and whether VPF data is reloaded. Select Location/Zoom In. Select VPF View/Reload All. Zoom out again, noting time needed to draw new map and whether VPF data is reloaded.	Zoomed out map is drawn quickly because data from original map was not purged. VPF data is reloaded to extents of smaller map (note "Loading" messages in status bar). Map is redrawn slowly because data outside Zoomed In map was purged and must be reloaded (note "Loading" messages in status bar).	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.7.8 Remove VPF View	Select Data/VPF View/Remove	Map is drawn without VPF features.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8 Add, modify, remove, and measure annotations	See Special Instructions for mouse and keyboard actions needed.		
5.2.8.1 Add points, lines, text, rectangles, range rings, polygons to map.	Hold down each button in tool bar.	Tool description displayed in status bar, except for Selection Tool (arrow).	**Windows:** PASS **Sun:** PASS **Solaris:** PASS

Requirement	Test Procedure	Expected Result	Results
	Click on each button in left section of tool bar and add one or more of listed features to map.	Annotations are added to map.	**SGI:** PASS **HP:** PASS
5.2.8.1.1 Allow choice of methods for positioning new annotation features.	See "Select method for positioning new annotations"		
5.2.8.2 Select annotations to be moved, deleted, or edited.	Press Selection tool button and click mouse on feature. Press Delete button on keyboard. Select multiple features. Press Delete. Click and drag feature. Select multiple features and drag.	Selection handles appear on rectangle containing feature. Selected feature is removed. Selected features are removed. Selected feature is moved. Selected features are moved.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS. Inability to Delete is documented.
5.2.8.2.1 Move point and text annotation features, and vertices in line features, via point-entry dialog.	Make sure Selection tool is down. Hold down CTRL key and click on existing point. Enter new coordinates and press OK. Repeat for text feature and vertices in a line, rectangle, or polygon.	Point-entry dialog appears, initialized with current point position. Feature is moved to new position. Text or vertex is moved to new position.	**Windows:** MARGINAL: When top-left corner of rectangle or last vertex of polygon is moved, figure is not closed again. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.2.8.3 Aggregate annotation line features into single line feature or into area feature.	Select 2 or more line features and click Line Aggregation Tool. Select 2 or more line features and click Ring Aggregation Tool.	Features are aggregated into single line feature. Features are aggregated into single area feature	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.4 Set anchor point for range and bearing measurement.	Press Anchor tool button and click mouse on desired map location. Move cursor around map. Press Anchor tool button again.	Range and bearing from the anchor point to cursor is displayed in status bar. Range and bearing measurement is no longer shown in status bar.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.5 Assign map tool functionality to the annotation layer (WIN32 Only).	Make sure no ODBC data source has been added to current map. Check "EDIT ANO" button.	Button is always enabled when no RDBMS Query has been added to map.	**Windows:** PASS **Sun:** N/A **Solaris:** N/A **SGI:** N/A **HP:** N/A
5.2.8.6 Assign map tool functionality to	Make sure no ODBC data source has been added to current map. Check	Button is disabled if no RDBMS Query has been added to map.	**Windows:** PASS **Sun:** N/A

Requirement	Test Procedure	Expected Result	Results
the ODBC query layer (WIN32 Only).	"EDIT SQL" button. .See "Add, modify, or remove a RDBMS query to ODBC data sources / Toggle between using map tools for RDBMS Query and annotation editing" to test tool with ODBC.		**Solaris:** N/A **SGI:** N/A **HP:** N/A
5.2.8.7 Edit symbology			
5.2.8.7.1 Allow choice between VPF and non-VPF symbol sets.	See ""Select Symbology" in "Map Settings" section.		
5.2.8.7.2 Modify symbol style and color of existing point, line, area, and text features.	Select feature and click Edit Symbology tool. Choose new symbology. Press OK. Repeat at least once for each feature type.	Symbology Selection window, with current style and color highlighted. Nonapplicable symbology choices disabled. Feature is redrawn with new symbology. Same as above, with appropriate choices enabled/disabled.	**Windows:** PASS. **Sun:** PASS. **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.7.3 Set default symbology to be applied to all future annotations.	Make sure no features are selected and click Edit Symbology tool. Change symbology for all feature types. Add at least one more of each type to map.	Symbology Selection window, with all choices enabled. All new features drawn with new symbology.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.7.4 When editing symbology, move directly to desired symbol in list of available symbols by entering its index (position in the list).	Select feature and click Edit Symbology tool. Enter new index in Index control and press Enter. Press OK.	Symbology Selection window, with current symbol's list position displayed in Symbol Index control. Symbol with that index is highlighted. Feature is redrawn with new symbol.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.8 Measure selected features	See Special Instructions.		
5.2.8.8.1 Display latitude and longitude in user-chosen units for point and text features.	Select at least one point and one text feature. Click Measure tool.	Geographic position of features displayed in window. Position in map cursor coordinate system.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.8.8.2 Show latitude and longitude of endpoints, and distance and azimuth	Select at least one line feature. Click Measure tool.	Geographic position for, and distance and azimuth between,	**Windows:** PASS **Sun:** PASS

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between points, in user-chosen units for line features.		endpoints of line segments are displayed in window. Distance and azimuth in units from Settings/ Units of Measure.	**Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.8.8.3 Show area in both spherical degrees and user-chosen units for area features.	Select at least one area feature. Click Measure tool.	Measurement information for component line segments as above, plus area in units from Settings/ Units of Measure.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.8.8.4 When airspace volume measurement functionality is enabled, prompt for desired lower and upper altitudes, and display volume above area feature, in user-chosen units.	Select Settings/Measurement/ Airspace Volume. Select at least one area feature. Click Measure tool.	Prompts for altitudes, then measurement information as above, plus airspace volume in units from Settings/ Units of Measure	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.8.9 Spatial query for VPF features	See Special Instructions.		
5.2.8.9.1 Display VPF attributes for selected VPF feature, including database, library, coverage, and feature class names.	Click Spatial Query tool and then one of each type of VPF feature.	Feature attributes displayed in Spatial Query Window.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.8.9.2 Display detailed measurements of VPF features when that setting is selected, in user-chosen units.	See "Toggle display of VPF feature measurement."		
5.2.9 Control input and output of data for annotation editor.	See Special Instructions.		
5.2.9.1 Save current annotations into NIMAMUSE VEC file.	Start with Settings/Vector Overlay/Binary. Add features of each type to map. Save as annotation file. Create new map, and open file into new map. Repeat for ASCII setting and annotation file.	Save-file dialog is initialized with '.vec' extension. Annotations from new file look like original annotations. Save-file dialog is initialized with '.asc' extension. Annotations from new file look like original annotations, except symbology is not preserved.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.2.9.2 Open existing NIMAMUSE VEC file.	Start with Settings/Vector Overlay/Binary. Select	Open-file dialog is initialized with '.vec' extension. Annotations in file	**Windows: PASS** **Sun: PASS**

	Data/Annotation File/Open. Open binary annotation file. Repeat for ASCII annotation file.	are drawn on map. Symbology is preserved. Open-file dialog is initialized with '.asc' extension. Annotations in file are drawn on map. Any non-default symbology is not preserved.	**Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.9.3 Clear annotation editor of all data	Select Data/Annotation File/Clear.	Annotations are removed.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.10 Save map image into file format suitable for exchange with other programs.	See Special Instructions		
5.2.10.1 Export map image as a bitmap (*.bmp), NIMAMUSE raster file (*.ima), or TIFF file (*.tif).	Select Data/Export Map Image/ As BMP. Save map as bitmap. Open file in program that handles *.bmp files.	Save-file dialog with prompt to save with ".bmp" extension. *.bmp file is created. Image looks like saved map.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
	Select Data/Export Map Image/ As NIMAMUSE Raster. Save map as NIMAMUSE raster file. Open file via Data/Raster File/ IMAGE File	Same as above except with *.ima extension..	
	Select Data/Export Map Image/ As TIFF. Save map as TIFF file. Open file via Data/RasterFile/ Import TIFF File and one other program that handles *.tif files.	Same as above except with *.tif extension.	
5.2.11 Fuse map overlays into basemap image.	Add one or more overlays (grat, UTM grid, annotation, overlay file, etc.) to map. Select Data/Fuse Overlays Press Fuse button.	Overlay is drawn, and can be edited and/or removed. Dialog explaining fusion process. Map is redrawn. Appearance is the same, but overlays are part of	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

Requirement	Procedure	Expected Result	Results
		background image and can't be edited/removed.	
5.2.12 Display palette	Select Data/Display Palette	Palette window appears.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.13 Toggle display of annotations (off and on) in one step.	Make sure Data/Declutter is not checked. Add several annotations to map. Check Data/Declutter. Select Data/Declutter again.	Annotations disappear. Annotations reappear.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.14 Constantly display cursor position, program status , and data (when applicable).	As stated in General Guidelines, this requirement should be monitored often, during most other tests, rather than in just a few specific test procedures.		
5.2.14.1 Display geographic location at cursor position in user-selected cursor coordinate system	Observe correlation between actual cursor position within map and cursor position readout in status bar.	Coordinates reported in status bar match cursor position and are in Map Cursor Coordinate System.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.14.2 Display abbreviation for horizontal datum associated with cursor coordinate system.	Observe Horizontal Datum abbreviation to the right of the cursor position in the status bar.	Abbreviation is for horizontal datum associated with Map Cursor Coordinate System.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.14.3 If map has raster background that associates data with each cursor position, display data in user-selected units.	Add DBDB5 or DTED raster background to map.	Status bar cursor position readout includes depth or elevation in vertical linear units selected under Settings/Units of Measure.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.2.14.4 Display message describing progress of operations.	Observe status bar messages before and during program operations.	Messages are clear and helpful in describing program actions.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

5.3 Map Location

See Special Instructions.

5.3.1 Reload VPF and Raster Product Data automatically from product as location is changed.	For as many Map Location test procedures as feasible, test with a map that has a VPF View and a map with a Raster product.	VPF data is reloaded as map is moved. See "Select attributes for VPF View" for settings that influence when reload is necessary. Raster product data is reloaded as map is moved.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.2 Double map scale in one-step operation (zoom in).	Note current scale. Select Location/Zoom In.	Map is redrawn at twice the scale (scale reciprocal, right hand value in ratio, is one-half as big).	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.3 Reduce map scale by one half in one-step operation (zoom out).	Note current scale. Make sure none of the current map extents is already at a map display coordinate system extent. Select Location/Zoom Out.	Map is redrawn at one-half scale. (scale reciprocal is twice as big). If Zoom Out immediately follows Zoom In, and map was not clipped, scale returns to value before Zoom In.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.4 Reload raster product at product's original scale.	Start with map with Raster Product and change scale so that it is different than default product scale. Select Location/Raster Zoom Reset.	Zoom factor is reset to default product scale (each pixel or data value is represented by exactly one pixel in the map display.)	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.5 Reset map to maximum geographical area in one-step operation	See Special Instructions. Select Location/Zoom Out Max.	Map area is reset to entire part of the world for which map display coordinate system is valid (zoomed out to maximum coordinate system limits).	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.6 Select new map center via mouse click, point-entry, or timed overlay file.	Select Location/New Map Center/Click on Map. Click on desired center. Select Location/New Map Center/By	Map is redrawn with clicked position as new center. Map is redrawn with entered	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS

Requirement	Action	Expected Result	Results
	Dialog. When point-entry dialog appears, enter desired center and press OK. Add timed overlay file to map as described in Special Instructions for "Scroll map area by timed overlay". Select Location/New Map Center/By Timed Overlay.	position as new center. Map is redrawn (one time only) with overlay file's annotation in the middle of the map.	**HP: PASS**
5.3.7 Sweep out new map area.	Sweep out desired area with mouse.	Map is zoomed in to swept area.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.8 Set map image size, geographic extents, center, and/or scale.	Select Location/By Dialog.	Map Area Configuration dialog.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.8.1 Provide several different methods for defining map parameters:	See Special Instructions.		
5.3.8.1.1 Enter center, scale, image size; compute geographic extents at sides of map	Click "Center Point, Scale, and Image Size (compute Geo-Extent)" radio button.	Controls for independent/dependent variables are enabled/disabled. For non-rectangular systems, extents values change if switching from 2nd method.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.8.1.2 Enter corner points of map, and scale; compute center, image size.	Click "Corners and Map Scale (Compute Map Center and Image Size)" radio button.	Controls enabled/disables as above. For non-rectangular systems, corners values change if switching from 1st or 3rd methods.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.8.1.3 Enter geographic extents and size; compute map center and scale.	Click "Geo-Extent and Image Size (Compute Map Center and Map Scale)" radio button.	Same as 3.8.1.1.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.8.1.4 For entry of extents and points, provide point-entry dialog.	Click Upper-right, Center, and Lower-left buttons.	Standard point-entry dialog, tailored to current Map Cursor Coordinate System.	**Windows: PASS** **Sun: PASS** **Solaris: PASS**

	Enter new value and press OK.	New value is displayed on button.	SGI: PASS HP: PASS
5.3.8.1.5 Allow choice of pixels, centimeters, or inches for entry/display of image size.	Click "in", "cm", and "pixels" radio buttons. See "Calibrate map image to hardware monitor" for testing accuracy of image size.	Widths and heights displayed in chosen units.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.3.8.1.6 Allow new parameter values to be examined via preliminary computation before map is redrawn.	Press "Compute…" button.	Dependent variables are recalculated and displayed.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.3.8.1.7 Provide drop-down list of common map scales.	Click 1st or 2nd radio button (so scale is independent). Operate Average Vertical Map Scale button.	List of common map scales.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.3.9 Reset map area to selected vector overlay file	Remove any raster file background from map. Make sure map has one non-world-wide vector overlay. Select Location/Zoom Out Max.	Map with overlay is drawn at maximum extents.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.3.9.1 Reset map area to vector overlay file's extents in one-step operation if only one overlay file is present.	Select Location/By Overlay.	Map is redrawn with overlay file extents.	Windows: MARGINAL: Sometimes map is clipped to 0 degrees lat and/or lon, not vec extents, on one or two sides. Sun: same as Windows Solaris: same as Windows SGI: same as Windows HP: same as Windows
5.3.9.2 Select desired vector overlay file from list if more than one file is present.	Add at least one more overlay to map. Select Location/By Overlay. Select Overlay and press OK.	"Select Overlay to Reset By" dialog with list of overlays. Map is redrawn with selected overlay's extents.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.3.10 Reset map area from VPF-coverage browse map when a VPF View is present.	Make sure map has VPF View (see "Add, modify, or remove views of VPF products")	Map has VPF data.	Windows: PASS Sun: PASS Solaris: PASS

			SGI: PASS
			HP: PASS
5.3.10.1 Provide several methods for using VPF-coverage browse map and modifying map setup:	Select Location/VPF Browse Map.	Unless disabled, VPF Product Area Reset window appears, displaying options for using browse map and modifying map setup.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.10.1.1 Relocate map by clicking new center or sweeping out new area in VPF-coverage browse map, or keep same location.	In "Browse Map" box, select "Click New Map Center" and press OK.	Browse map appears.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
	Click on new center point.	Map, including VPF data, is redrawn with new center.	
	Repeat with "Sweep Out New Map Area" option.	Browse map appears and then map is redrawn into swept-out area.	
	Repeat with "Keep Same Map Center" option.	Browse map does not appear, and map center is not changed.	
5.3.10.1.2 Scale map by using default VPF product scale or by choosing from list of common scales.	In "Scale" box, select "Use Product Scale" option and press OK.	Map is drawn with pixel to pixel correspondence between raster product and map display.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
	Repeat with "Choose Scale" option.	Map is drawn with chosen scale.	
5.3.10.1.3 Change map size in pixels.	In "Image Size in Pixels" box, enter new map window dimensions and press OK.	Map is drawn with new size.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.10.2 Allow the display of the VPF relocation dialog to be suppressed.	Check "Don't show this dialog again", press OK, and select Location/VPF Browse Map.	Product Area Reset dialog is not displayed before map is redrawn.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
	See "Select attributes for VPF View" to re-enable window.		
5.3.11 Reset map area from browse map that shows coverage of raster	Make sure map has Raster Product data (see "Access raster products")	Map has Raster Product background.	**Windows:** PASS **Sun:** PASS

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product data.			Solaris: PASS SGI: PASS HP: PASS
5.3.11.1 Provide several methods for using browse map and modifying map setup (see description for VPF above).	Make sure map has Raster Product data. Select Location/Raster Browse Map Test options as in "Reset map area from VPF browse map" above. See "Select terrain rendering, palette, and map resetting options for raster basemaps" to re-enable window.	Unless disabled, Raster Product Area Reset window appears, displaying options. Results are as described above for VPF browse map.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.12 Scroll map area by timed vector overlay.	See Special Instructions for how to create and add the timed overlay. Select Location/Scroll By Timed Overlay.	Vector overlay file is reloaded at specified timer interval. When symbol gets near edge of the map, map window scrolls automatically.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.13 Scroll map area by dead reckoning.	Select Location/By Dead Reckoning.	Dialog prompting for speed and heading.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.13.1 Move map center according to a user entered speed and direction.	Enter desired speed and heading and press OK.	Black diamond, starting at map center and moving at desired speed and heading, shows current location. Position, speed, and heading displayed in window title.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.3.13.2 Reload raster and VPF product data as needed.	Allow location marker to approach map edge.	Data is reloaded as needed.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**

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5.3.14 Limit location changes when map background is from raster file.	Add raster file background, vector overlay, and VPF view to map.	Map is redrawn with new background and data.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.14.1 Disable location changing via new center, sweep, maximum zoom out, vector file extents, and VPF browse map.	Select Location menu item.	Zoom Out Max, New Map Center, Sweep Out Area, By Overlay, and VPF Browse Map (when applicable) are disabled.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.14.2 Make relocation dialog (for setting map image size, geographic extents, center, and/or scale) read-only.	Select Location/By Dialog.	Map geometry controls are read-only.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.3.14.3 Use pixel replication/pixel down-sampling to allow a limited amount of zooming in/out.	Select Zoom In three times. Try to select Zoom In once more. Start with original map. Select Zoom Out several times. Try to select Zoom Out once more.	Zoomed-in map is redrawn via pixel replication three times. Zoom In is disabled, allowing only three zoom-in operations. Zoomed-out map is redrawn via pixel down-sampling three times. Zoom Out is disabled.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

5.4 Map Settings

5.4.1 Associate user-entered information with map.	Select Settings/MapDescription.	Description window initialized with "User comments and description are added here" in edit area.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.1.1 Supply text edit area for entering user information.	Type any comments into edit area. Press OK. Select Settings/Map Description.	Comments are displayed.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.1.2 Display basic attributes of map as read-only text in window.	Compare map information at top of Description window to known map parameters.	Scale, coordinate system, horizontal datum, and information about products when they are present.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS

			SGI: PASS HP: PASS
5.4.2 Select map display coordinate system.	See Special Instructions. Select Settings/Map Display Coordinate System.	Coordinate System Selection dialog.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.1 Choose from list of common predefined coordinate systems suitable for use as map display systems.	If Pre-defined List radio button is not selected, click on it. Select new system from list and press OK.	List of all predefined systems from the NIMA mdtcc library, except for UTM, MGRS, and any other system not considered to be a "drawing system". If current map is not completely within extents of new system, message that map will be clipped.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.2 Allow option of changing map cursor coordinate system to new map display system.	Before map is drawn, prompt asks whether cursor system should be changed to new display system. Press Change. Repeat 4.2.1, only press NO when prompt asks about changing cursor system.	Map is drawn on new display system and cursor position display in status bar is changed to same system. Map is drawn on new display system but cursor position display in status bar is for previous system.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.3 View parameters of selected coordinate system.	Select Settings/Map Display Coordinate System. Select system. Press Configure New System button.	Coordinate System Configuration dialog, initialized with parameters of selected system, except for Name.	**Windows: MARGINAL:** Coordinate Units list not initialized with current units if units aren't degrees or meters. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.4.2.3.1 Parameters that are not applicable to current coordinate system have disabled controls.	Observe which controls are enabled. For projection-based system, press Other Projection Parameters button and observe controls in new dialog. Repeat for at least one additional system.	Inapplicable controls are disabled.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.4 Create new user-defined coordinate systems.	All controls for 4.2.4 refer to Coordinate System Configuration dialog, unless otherwise noted. Select system, choosing existing system	Coordinate System Configuration dialog, initialized with parameters of selected system, except for Name.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS**

Requirement	Procedure	Expected Result	Result
	that is similar to desired new system. Press Configure New System button.		HP: PASS
5.4.2.4.1 Predefined coordinate systems can not be edited, and every system must have a unique name.	Observe Name control. Type existing system name into Name and press OK.	Control is initialized with long default name intended to guarantee uniqueness. Error message that name is not unique.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.2.4.2 User-defined coordinate systems are displayed in a separate list.	Change name to meaningful but unique name, and press OK.	Return to Coordinate System Selection dialog, where User-defined radio button is enabled and new system name is added to separate list of user-defined systems.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.2.4.3 User-defined coordinate systems are automatically saved to file.	Create valid system and exit program. Restart program.	User-defined systems are still in list.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.2.4.4 User-defined coordinate systems can be deleted from the list and file.	Display user-defined list in Selection dialog. Select system. Press Delete. Exit and restart program.	System name is removed from list.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.2.4.5 Controls for choosing units of measure and projections for user-defined coordinate system are lists of predefined items.	After choosing projection-based system in Selection dialog.. operate units and projection list buttons. Select new units, press OK in Configuration and Selection dialogs, slave cursor system to display system, and redraw map. Choose GP system.	Linear units and projections supported by mdtcc library are in lists. Map cursor position uses new units. Angular units supported by mdtcc library are in units list. (Projection list is disabled.)	**Windows: MARGINAL:** Universal Polar Stereographic projection is not in list, so UPS-based systems are displayed with Albers projection selected in projection list. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.4.2.4.6 Choosing a new projection for user-defined coordinate system enables/disables or re-initializes projection-dependent controls.	Note state of projection-dependent controls before and after choosing new projection.	Controls are re-initialized and/or enabled/disabled as needed or reasonable for new projection.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.2.4.7 Control for horizontal datum	See "Select Horizontal Datum."		

selection for user-defined coordinate system invokes new window with list of common predefined horizontal datums.			
5.4.2.4.8 When creating coordinate system, reset button restores all parameter values to the defaults .	Change some system values and them press Reset button.	All parameter values restored to the default initialization values.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.5 Select horizontal datum.	In Coordinate System Configuration dialog, press Horizontal Datum button	Local Datum Selection dialog, with list of predefined datums.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.5.1 Window for viewing current horizontal datum's parameters displays name, area/country, datum translations, and ellipsoid.	.Select datum and press "View Datum" button.	Listed parameters are displayed in "Datum Definition" dialog.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.5.2 Window for viewing current ellipsoid's parameters displays name, semi-major axis, and reciprocal of the flattening.	In "Datum Definition" dialog, press Ellipsoid button.	Listed parameters are displayed in "Ellipsoid Definition" dialog.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.2.6 Disable map display coordinate system selection when raster file or product background is present.	Close all system, datum, and ellipsoid dialogs. Select Data/Raster File and add raster file background to map. Repeat for Data/Raster Product	Settings/Map Display Coordinate System is disabled. Same as above.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.3 Select monitor settings	Select Settings/Display Display rectangle and prompt for measurement and entry of its size Compute monitor's actual pixel size and adjust map geometry.	Submenu with "Monitor Calibration" and "Colors" appears.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.3.1 Calibrate map image to hardware monitor by adjusting map	Select Settings/Display/Monitor Calibration. Measure and enter the width and height	Window with rectangle of known pixel dimensions appears. Window disappears.	**Windows: MARGINAL:** when using cm or in, map is 2-3% taller than height value displayed in Map Area dialog.

geometry to actual pixel size.	of the rectangle (using a ruler on the screen). Press OK. Specify map image size in cm in Map Area Configuration dialog. Press Compute button, and record Computed Width and Height. Press OK. Measure map. Select Settings/Save Settings as Defaults. Select Settings/Display/Monitor Calibration.	Map is desired size in cm. Calibration window is initialized with correct width and height.	**Sun: PASS** **Solaris:** same as Windows **SGI: MARGINAL:**map is slightly smaller than values displayed in Map Area dialog **HP:** same as SGI
5.4.3.2 Select monitor's color setting (Win32 only).	See Special Instructions.		**Windows: PASS** **Sun: MARGINAL:** NA, so menu item should be disabled. **Solaris:** same as Sun **SGI:** same as Sun **HP:** same as Sun
5.4.4 Select units of measure.	See Special Instructions.		
5.4.4.1 Display lists of standard units for horizontal linear, vertical linear, area, volume, and azimuth/bearing measurement.	Record values for data and annotation measurements as described in Special Instructions. Select Settings/Units of Measure.	Units dialog with list buttons for each required unit of measure.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: MARGINAL:** Lists are truncated at bottom—can't see last item
5.4.4.2 Apply selected units to feature measurement and display of map data.	Select desired units, press OK, and repeat recording of measurements.	Data and annotation measurements use new units, and values have been converted accurately.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.5 Select default working directory for current map.			
5.4.5.1 Display standard GUI open-file dialog for choosing directory.	Select Settings/Working Directory. Move to desired directory, choose any file, and press OK.	Standard open-file dialog. Dialog disappears.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.5.2 Open-file and save-file dialogs for current map are initialized to	Add data to map using Data/Raster File, Data/Overlay Files, and	Open-file dialog is initialized to working directory.	**Windows: PASS** **Solaris: PASS**

Requirement	Action	Expected Result	Test Results
working directory.	Data/Annotation File. Save map data using Data/Annotation File and Data/Export Map Image File. See Special Instructions.	Save-file dialog is initialized to working directory.	Sun: PASS SGI: PASS HP: PASS
5.4.6　Set attributes for map cursor.			
5.4.6.1 Select coordinate system for display of spatial position of cursor and measurement tool points.	Note current cursor and measurement position displays as in Instructions. Select Settings/Map Cursor/Coordinate System. Choose or create system that has different units and datum than current system(see "Select map display coordinate system"), and press OK. Repeat check of current cursor and measurement position displays.	Coordinate System Selection dialog initialized to system that produces current status bar information. Displays conform to new cursor system.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.6.2 Display form tailored to cursor coordinate system for all point entry operations.	Note current coordinate system. Select various operations that use a point-entry dialog (Location/By Dialog, Location/New Map Center/By Dialog, annotation ops with Settings/Annotation/Prompt on Input, etc.).	Point-entry dialog tailored to system appears.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.6.2.1 In point-entry dialog, tailor edit controls to cursor system and initialize with reasonable values.	Manipulate edit controls.	Controls are tailored to cursor coordinate system, initialized properly, and aid in entry of valid values.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.6.2.2 In point-entry dialog, reject most invalid characters and detect out-of-range errors as much as possible.	Try to enter invalid characters and out-of-range values.	Invalid characters are immediately rejected. Out-of-range values produce an error message at least by time OK button is pressed, if not before.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.6.3 Select cursor style from arrow symbol, plus symbol or cross symbol.	Select Settings/Map Cursor/Style. Select Arrow, Plus, and Cross in turn.	Sub-menu of available styles. Map cursor conforms to selected style	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**

Requirement	Test Procedure	Expected Result	Test Result
5.4.7 Select measurement options.	Select Settings/Measurement	Sub-menu for changing VPF View and volume measurement options.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.7.1 Toggle display of VPF feature measurement.	Begin with map that has VPF View. Toggle Settings/Measurement /VPF Features to "On" (checked in menu). Use Spatial Query tool on at least one VPF Feature. Toggle Settings/Measurement /VPF Features to "Off" (not checked in menu). Use Spatial Query tool again.	Measurement data, as well as VPF feature attributes, are displayed in Spatial Query window. No measurement data is displayed in Spatial Query window.	**Windows:** FAIL: Area measurements are sometimes inaccurate. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows
5.4.7.2 Toggle display of airspace volume.	Begin with map that has both VPF and annotation area features. Toggle Settings/Measurement/ Airspace Volume to "On" (checked in menu). Use Spatial Query tool on at least one VPF area. Enter altitudes. Use measurement tool on at least one area annotation.	Prompt for entering lower and upper altitudes in user-chosen vertical linear units (see "Select units of measure"). Volume measurement data added to display in Spatial Query window. Prompt appears as above. Then volume displayed in Measurement window.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.8 Select terrain rendering, palette, and map resetting options for raster basemaps.	Start with map that has DTED or DBDB5 raster background. Select Settings/Raster Basemap.	Sub-menu of terrain and palette items.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.8.1 Select terrain colors for digital elevation data in color look-up table.	See Special Instructions. Select Settings/Raster Basemap/Terrain Colors.	Terrain Color Look Up Table appears.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.8.1.1 Assign hue, saturation, and value to up to six data ranges in color look-up table.	Adapt color scheme to elevation range of current raster background.	Color scheme used to render elevation data changes as expected.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS

			HP: PASS
5.4.8.2 Select sun position for raster backgrounds that have associated data from eight compass positions, or remove shading for sun position.	Select Settings/Raster Basemap/Terrain Sun Position. Choose at least two different sun positions.	Sub-menu of eight compass positions, and "Off". Hill shading in raster background is simulated for that sun position (map is redrawn with light coming from chosen direction).	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
	Select Settings/Raster Basemap/Terrain Sun Position/Off.	Hill shading is removed from raster background.	
5.4.8.3 Provide option to display key to terrain colors on map.	Select Settings/Raster Basemap/Look Up Table Location. Select one of locations.	Submenu of possible locations and 'Off'. Key to color scheme created in Terrain Look Up table conforms to scheme and appears near chosen location (placement depends on size of map).	**Windows: PASS** **Sun: MARGINAL.** Colors in key do not reflect map color scheme. **Solaris: same as Sun** **SGI: same as Sun** **HP: same as Sun**
	Select at least one other location, and then select 'Off'	Key is moved and then removed as expected.	
5.4.8.4 Select palette colors option:	Select Settings/Raster Basemap.	Four palette options are in middle of sub-menu.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.8.4.1 Provide "colors only" palette option.	Select Settings/Raster Basemap/Colors Only.	Map has colors similar to, but not necessarily identical to the original paper map. (Basemap colors are chosen from the color section of the default color palette.)	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.8.4.2 Provide "grays only" palette option.	Select Settings/Raster Basemap/Grays Only.	Map is redrawn in shades of gray. (Basemap colors are chosen from the gray section of the palette).	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.8.4.3 Provide "both colors and grays" palette option.	Select Settings/Raster Basemap/Both Grays and Colors.	Map has both colors and gray shades. (Basemap colors are chosen from both the RGB and the Gray sections of the palette.)	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS**

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			HP: PASS
5.4.8.4 Provide native raster palette option.	Add CADRG 1:1M scale raster background to map. Select Settings/ Raster Basemap/Native Raster Palette.	For basemap images that have their own 2 and 4 bit color palettes, basemap colors are chose from the native palette. Map colors are most like those of the original paper product.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.4.8.5 Toggle display of window that provides options for resetting map using raster product browse map	Select Settings/Raster Basemap. If "Show Reset Dialog" is not checked, select it to toggle it to on position. Add new raster product to map.	Product Area Reset dialog appears after product file is opened.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
	Select Location / Raster Browse Map.	Product Area Reset dialog appears.	
	Toggle "Show Reset Dialog" to off position and repeat.	Product Area Reset dialog does not appear when product is added or when browse map is displayed.	
5.4.9 Select vector overlay file format.	Select Settings/Vector Overlay.	Sub-menu of file formats.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.4.9.1 Choice of ASCII or binary format for overlay file and annotation file input and output.	See "Add, modify, and remove vector overlay files" and "Control input and output of data for annotation editor."		
5.4.10 Select settings for RDBMS (WIN32 only).	Start with map with associated RDBMS Query. Select Settings/RDBMS.	Submenu--Edit and Table Contents.	Windows: PASS Sun, SGI, Solaris, HP: N/A
5.4.10.1 Set valid RDBMS editing options:	Select Settings/RDBMS/Edit	Submenu of editing options.	Windows: PASS Sun, SGI, Solaris, HP: N/A
5.4.10.1.1 Allow separate enabling/disabling of editing options (select, move, delete, create) for RDBMS features.	Make sure EDIT SQL tool is pushed. Toggle "Select" to OFF (unchecked). Press Selection Tool in Toolbar and click on feature. Toggle "Select" to ON (checked). Press Selection Tool in Toolbar and click on feature. Toggle "Create" to OFF. Press on tool button for a type of feature valid for the	. Selection handles do not appear on feature. Selection handles appear on feature.	Windows: MARGINAL: button states don't always respond to changes in Edit menu. Toggling Select to OFF doesn't disable the Select button if any other Edit item is already turned off. Sun, SGI, Solaris, HP: N/A

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Requirement	Test Procedure	Expected Result	Test Results
	current table, and click in map. Toggle "Create" to ON. Press on tool button for a type of feature valid for the current table, and click in map	New feature is not created. / New feature is created.	**Windows: PASS** **Sun, SGI, Solaris, HP: N/A**
	Make sure "Select" is ON. Then Toggle "Delete" to OFF. Select feature and press Delete key.	Message that Delete function is disabled. Feature is not removed.	
	Toggle "Delete" to ON and repeat deletion operation.	Feature is deleted.	
	Toggle "Move" to OFF. Select feature and attempt to drag with mouse.	Warning beep and feature is not moved.	
	Toggle "Move" to ON and repeat move operation.	Feature can be moved.	
5.4.10.1.2 Toggle form that shows RDBMS feature's attributes between read-only and user-editable.	Toggle "Form" to On (checked). Double-click feature in map. / Toggle "Form" to Off (unchecked). Double-click feature in map.	Form that shows feature's attributes has text edit controls into which new values can be entered. / Form that shows feature's attributes is read-only.	
5.4.10.1.3 Provide options that enable or disable all the RDBMS editing options listed above in one step.	Select Settings/RDBMS/Edit/All. Then Select Settings/RDBMS/Edit. Select Settings/RDBMS/Edit/None. Then Select Settings/RDBMS/Edit.	All Edit items above line are checked. All Edit items above line are unchecked.	**Windows: MARGINAL:** Selecting None doesn't disable the buttons until the next execution of a drawing query, and then the Select button is not disabled. **Sun, SGI, Solaris, HP: N/A**
5.4.10.2 Set supported feature types for new RDBMS table.	Make sure Settings/RDBMS/Edit/Create is checked. Select Settings/RDBMS/Table Contents.	Submenu of standard feature types to support in next new table.	**Windows: PASS** **Sun, SGI, Solaris, HP: N/A**
5.4.10.2.1 Enable/disable support for adding point, line, area, text, range ring, and/or waypoint features to new RDBMS table.	Toggle features On and Off.	Items are checked and unchecked as expected. (See "Create tables containing point, line, area, text, range ring, and/or waypoint features" for testing creation of tables)	**Windows: MARGINAL:** Range Rings item would not stay checked unless it was turned on with the "All" menu item. **Sun, SGI, Solaris, HP: N/A**
5.4.10.2.2 Provide options that enable or disable all the RDBMS table contents options listed above in one step.	Select Settings/RDBMS/ Table Contents /All. Then Select Settings/RDBMS/ Table Contents. Select Settings/RDBMS/ Table Contents	All Table Contents items above line are checked. All Table Contents items above line are	**Windows: PASS** **Sun, SGI, Solaris, HP: N/A**

	/None. Then Select Settings/RDBMS/ Table Contents.	unchecked.	Windows: PASS Sun: PASS Solaris: PASS SGI: PASS HP: PASS
5.4.11 Select attributes for VPF View.	Select Settings/VPF View.	Submenu of data caching and buffering options.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.11.1 Toggle caching of VPF feature class data.	Toggle Settings/VPF View/ Keep Unused Data to On (checked). Add 10-12 VPF View themes to map and draw map, noting time needed to load data. Unselect all themes in view and redraw map. Then select all themes once more and redraw map, noting time needed before map is redrawn.	Pause while data is loaded, with "Loading…" messages in status bar. Data is redrawn quickly, without reloading (unselected themes were saved in memory).	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.11.2 Select buffer size for loading VPF data from area either same size as, or 1.5 or 2 times larger than the map area.	Select Settings/VPF View/ 2.0X Buffer. Add VPF View to map. Zoom Out.	Data is redrawn quickly, without reloading (data outside original map extents was already in memory).	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.11.3 Toggle display of window that provides options for resetting map using VPF-coverage browse map	Select Settings / VPF View. If "Show Reset Dialog" is not checked, select it to toggle it to on position. Add new VPF data to map. Select Location / VPF Browse Map. Toggle "Show Reset Dialog" to off position and repeat.	Product Area Reset dialog appears after data is added. Product Area Reset dialog appears. Product Area Reset dialog does not appear when product is added or when browse map is displayed	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.11.4 Provide option to thin equivalent VPF text features.	Toggle Settings/ VPFView/ Show All Text Features to On (checked). If necessary, add text features until multiple occurrences of the same text appear on map. Toggle Settings/ VPFView/ Show All Text Features to Off (unchecked).	Multiple occurrences of identical text are no longer displayed.	**Windows: PASS** **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS

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Requirement	Procedure	Expected Result	Results
5.4.12 Select Symbology			
5.4.12.1 Choose between VPF symbol set and other, non-VPF symbol set for support of tactical overlays, etc.	Select Settings / Symbology / VPF. Add annotations to map. Double-click a symbol.	Symbol Selection dialog appears and displays standard VPF symbology choices.	**Windows: PASS** **Sun: PASS.** **Solaris: PASS** **SGI: PASS** **HP: PASS**
	Select Settings / Symbology / Other. Add annotations to map. Double-click a symbol.	Symbol Selection dialog appears and displays non-VPF choices.	
5.4.13 Select method for positioning new annotations.	Select Settings/Annotation	Menu item "Prompt on Input" appears.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.13.1 Allow choice between positioning new features with mouse alone, or with mouse and point-entry dialog(s).	Toggle Prompt on Input to ON. Use Map Toolbar to add new point annotation feature, noting cursor position. Enter new position and press OK. Toggle Prompt on Input to OFF and add new point annotation feature. Repeat for text and line features. See Special Instructions.	Point-entry dialog appears when mouse is clicked on map to add feature, initialized with position that was clicked. Feature is drawn at entered position. Point-entry dialog does not appear (feature is immediately drawn where mouse was clicked). Point-entry dialog(s) appear when Prompt on Input is ON and do not appear when it is OFF.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.14 Select image processing option for CIB raster product.	Select Settings/CIB Enhancement.	Submenu of Enhancement options.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**
5.4.14.1 Provide CIB image enhancement by linear stretch.	Select Settings/CIB Enhancement/Linear Stretch.	CIB pixel intensity range is stretched linearly over the gray scale palette, providing contrast enhancement.	**Windows: PASS** **Sun: PASS** **Solaris: PASS** **SGI: PASS** **HP: PASS**

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Requirement	Test Procedure	Expected Result	Actual Result
5.4.14.2 Provide three options for CIB image enhancement using stretch by standard deviation.	Select Settings/CIB Enhancement/ 2 Standard Deviation Stretch. Repeat for 3 and 4 Standard Deviation options.	Mean is stretched +/- 2 standard deviations over the gray scale palette. Mean is stretched +/- 3,4 standard deviations over the gray scale palette.	**Windows:** PASS **Sun:** FAIL: 3 and 4 Std. Deviation infrequently crashed program. Crash was not reproducible. **Solaris:** same as Sun **SGI:** PASS **HP:** PASS
5.4.14.3 Provide CIB image enhancement by histogram equalization.	Select Settings/CIB Enhancement/ Histogram Equalize.	CIB intensities are redistributed such that each value in the gray scale palette gets about the same number of pixels.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.15 Select maximum number of map windows.	Select Settings/Max Maps Displayed. See "Create new map" and "Open and view existing map" for testing response to value entered.	Form that prompts for maximum number of map document windows that can be open at one time.	**Windows:** PASS **Sun:** PASS **Solaris:** PASS **SGI:** PASS **HP:** PASS
5.4.16 Select full menu or custom menu(WIN32 only) .	See Special Instructions	Menu appears as expected from setup in "muse.ini"	**Windows:** MARGINAL: in advanced testing (not part of normal program operation), switching from custom to full menu crashes program. **Sun:** NA **Solaris:** NA **SGI:** NA **HP:** NA
5.4.17 Save settings as defaults.	See Special Instructions for complete list of settings that will be saved. Note settings for current map. Select Settings/Save Settings as Defaults. Select File/New.	"muse.ini" initialization file is updated with defaults of existing map. New map uses these defaults	**Windows:** MARGINAL: Checked Settings/Measurement items don't get checked in new map. **Sun:** same as Windows **Solaris:** same as Windows **SGI:** same as Windows **HP:** same as Windows

5.5 Other Requirements

Requirement	Test Procedure	Expected Result	Actual Result
5.5.1 Choose and launch another program while current program is running.	Select Launch/Program from main menu. Select desired program and press OK.	Standard open-file dialog for choosing path and file appears. Program is launched.	**Windows:** PASS **Sun:** MARGINAL: Open-file dialog is initialized with "*.exe", so files aren't displayed in list.

			Solaris: same as Sun SGI: same as Sun HP: same as Sun
5.5.2 Provide standard window and icon manipulation utilities (WIN32 only).	Start with several open maps. Select the Window item in the main menu. Select Tile and Cascade. Minimize two or more map windows to create icons and move them around the screen. Select Arrange Icons. Select various maps from the list of open maps.	Map windows are arranged as expected. Icons are arranged in bottom of task window. Clicking on the name of an inactive map brings it to the foreground.	Windows: PASS Sun: NA Solaris: NA SGI: NA HP: NA
5.5.3 Provide standard on-line help file.	Select Help from the menubar, from various Help buttons in dialogs, and from the Help button in the Toolbar ("question mark" button).	On-line help is displayed and manipulated as expected. Help buttons are context-sensitive.	Windows: MARGINAL: Help button in several small dialogs (e.g. graticule colors and styles) is inoperative. Sun: same as Windows Solaris: same as Windows SGI: same as Windows HP: same as Windows

6 SUMMARY OF TEST RESULTS

It should be noted that it was not possible in this evaluation to exhaustively test every possible combination and sequence of program operations, nor to perform all the test procedures on the final executable delivered to NIMA. Fusion 2.1 is a powerful and flexible program, and time and resources did not allow each requirement to be tested in every possible context (type of raster background and overlay, settings options, map geometry, etc.).

In addition, testing took place over a period of several months, during which time the program was constantly being upgraded as problems were discovered. Every effort was made to retest (on all platforms) the program functionality that was most likely to be affected by each change, and the final executable was tested extensively on two platforms, Windows and Solaris, by performing each of the test procedures.

6.1 Bugs

These were the problems that occurred while testing Fusion 2.1. The items in the lists below give the requirement tested, and the results of the test..

6.1.1 Major Bugs

These bugs either cause the program to crash with no known work-around, produce inaccurate output, or are a major inconvenience to the user. They resulted in a "FAIL" rating in the Test Procedures chart.

5.4.7.1 Toggle display of VPF feature measurement: Area VPF measurements are sometimes inaccurate.

5.4.14.2 Provide three options for CIB image enhancement using stretch by standard deviation: 3 and 4 Standard Deviation Stretch infrequently crashed program. Crash was not reproducible. (Sun and Solaris only).

6.1.2 Minor Bugs

These bugs cause minor inconvenience to the user. They resulted in a "MARGINAL" rating in the Test Procedures chart.

5.1.2.2 Open map document window initialized with values from file: Sometimes program operations corrupt map colors, and colors must be restored by resizing map or by causing map to be redrawn by changing Settings (UNIX platforms only).

5.1.3.1 Detect any unsaved changes to map and prompt user to save map to file before closing: Some Settings changes, like Symbology, don't invoke the prompt to save changes when the map is closed.

5.1.3.3 Detect any unsaved changes in all open map files when program is exited: Some Settings changes, like Symbology, don't invoke the prompt to save changes in open maps when the program is exited.

5.1.5 Revert to last saved version of map, discarding changes since save: Revert to Saved is not re-enabled by some Settings menu changes (e.g. Units of Measure, cursor symbol, Measurement)

5.1.6.1 Save map image for import into non-NIMAMUSE software, including file formats TIFF, BMP, and NIMAMUSE Raster: After the first Print op, the dialog for choosing the format doesn't appear again (previous

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format is used to initialize save-file dialog).

5.2.3.1 Initialize new graticule with defaults based on map scale: Occasionally there are line segments missing out of graticule lines (UNIX platforms only), and degree symbols are improperly placed in labels (SGI only).

5.2.3.4 Remove graticule when desired: When grat is removed from a grat-only map, background changes from white to gray, giving the impression that map has disappeared.

5.2.4.1 Display UTM grid with default spacing, colors, and labels based on map scale: Occasionally there are line segments missing out of grid lines (UNIX platforms only).

5.2.4.3 Remove UTM grid when desired: When UTM grid is removed from a grid-only map, background changes from white to gray, giving the impression that map has disappeared.

5.2.6.8 Use program's map tools to interactively edit RDBMS data source: Changes can be made to symbology of existing SQL features, but they are only temporary. Vertices can be moved only temporarily with the new Ctrl/Click feature. If modification is not supported, tools to do it should be disabled (Windows only).

5.2.6.10 Create RDBMS tables containing point, line, area, text, range ring, and/or waypoint features: Unable to draw SQL range rings or area features (Windows only).

5.2.6.11 Provide text edit form for displaying/modifying data record attributes of an RDBMS data record: Changes made in the Form (lat, lon, color, style, etc.) are not drawn until the draw query is executed (not when the OK button is pressed in the Form Dlg) (Windows only).

5.2.7.3.3. Remove VPF database: Program occasionally crashed when trying to Delete the last VPF database in the Feature Selection window (Sun and Solaris only). This bug can be avoided by using one of the following work-arounds:
> If the user wants to remove all databases from the map, this is equivalent to removing the VPF View, and he should select Data/VPF View/ Remove instead of deleting the last database from the list in the Feature Selection window.
> If the user wants to remove the existing database and add a new database, he should add the new one before deleting the old one.

5.2.8.2.1 Move point and text features, and vertices in line features, via point-entry dialog: When top-left corner of rectangle or last vertex of polygon is moved via Ctrl Key/Point-Entry Dialog method, figure is not closed.

5.3.9.1 Reset map area to file's extents in one-step operation if only one vector overlay file is present: Map was sometimes clipped to 0 degrees latitude or longitude on one or two sides instead of to the overlay file extents .

5.4.2.3 View parameters of selected coordinate system: In Coordinate System Configuration window, list is not initialized with the current units if they are not meters or degrees.

5.4.2.4.5 Controls for choosing units of measure and projections for user-defined coordinate system are lists of predefined items: Universal Polar Stereographic projection is not in projection list in Coordinate System Configuration window, so UPS-based systems are displayed with Albers projection selected in projection list.

5.4.3.1. Calibrate map image to hardware monitor by adjusting map geometry to actual pixel size: When using "cm" or "in" to enter map size, map height is slightly different than height value displayed in Map Area dialog (all platforms except Sun).

5.4.3.2 Select monitor's color setting (Win32 only): Settings/Display/Colors should be disabled on UNIX platforms.

5.4.4.1 Display lists of standard units for horizontal linear, vertical linear, area, volume, and azimuth/bearing measurements: In Units dialog, bottom list items not displayed (HP only).

5.4.8.3 Provide option to display key to terrain colors on map: The colors displayed in the LUT "key" do not reflect the color scheme chosen for terrain colors (UNIX platforms only).

5.4.10.1.1 Allow separate enabling/disabling of editing options (select, move, delete, create) for RDBMS features and
5.4.10.1.3 Provide options that enable or disable all the RDBMS editing options listed above in one step: Toolbar buttons aren't always disabled by Settings/RDBMS/Edit menu items as expected (Windows only).

5.4.10.2.1 Enable/disable support for adding point, line, area, text, range ring, and/or waypoint features to new table: Range Rings item would not stay checked unless it was turned on with the "All" menu item.

5.4.16 Select full menu or custom menu(WIN32 only): Toggling between custom and full menus doesn't work. When muse.ini is set up with a custom menu that contains menu items /Full and /Custom (not part of normal program operation), clicking on Full crashes the program (Windows only).

5.4.17 Save settings as defaults: Toggling the two Settings/Measurement items to ON and selecting Save Settings as Defaults does not cause the two items to be turned on in new maps. "muse.ini" does get updated.

5.5.1 Choose and launch another program while current program is running: Open-file dialog for Launch is initialized with "*.exe", so no executables are displayed in list (UNIX platforms only)

5.5.3 Provide standard on-line help file: Help button in several small dialogs (e.g. graticule colors and styles) is inoperative.

7 CONCLUSIONS

176 individual tests were performed on each of 5 computer platforms, and 24 tests were performed on the Windows platform only (for the requirements that were applicable only to PC computers). There were 904 tests in all.

A test produced a "FAIL" rating if it caused the program to crash with no known work-around, produced inaccurate output, or was a major inconvenience to the user. Only one test failed on all 5 platforms. One other test failed on two UNIX platforms. Seven failures in 904 tests is a failure rate of 0.8 percent.

A test produced a "MARGINAL" rating if there was any discrepancy between the expected result and actual result that was considered to be even a minor inconvenience to the user. Eleven tests were deemed to have produced marginal results on all platforms. The number of platform-specific additional marginal ratings were: 9 on Windows, 7 on Sun, 8 on Solaris, 7 on SGI, and 8 on HP, for a total of 94 marginal ratings. Ninety-four marginal ratings in 904 tests is a marginal rate of 10.4 percent.

While falling short of the elusive goal of software perfection, and considering the difficulties associated with development across multiple operating systems and windowing systems, a failure rate of less than one percent reflects the dedication of the NIMAMUSE team at both NIMA and NRL.

8 REFERENCES

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Fusion 2.1 User's Guide.
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9 ACKNOWLEDGMENTS

10 APPENDICES

10.1   Appendix A   Acronyms

Acronym	Meaning
ADRG	ARC Digitized Raster Graphics
ADRI	ARC Digital Raster Imagery
ARC	Equal Arc Second Raster Chart/Map
ASRP	Arc Standard Raster Product
BMP	Bitmap Graphics Format
CAC	Compressed Aeronautical Chart
CADRG	Compressed ARC Digitized Raster Graphics
CIB	Controlled Image Base
CRP	Compressed Raster Product
DBDB	Digital Bathymetric Database
DM	Degrees Minutes
DMS	Degrees Minutes Seconds
DTED	Digital Terrain Elevation Data
GUI	Graphical User Interface
MC&G	Mapping, Charting, and Geodesy
MGRS	Military Grid Reference System
NIMA	National Imagery and Mapping Agency
NIMAMUSE	NIMA Mapping, Charting and Geodesy Utility Software Environment
RDBMS	Relational DataBase Management System
SRG	Standard Raster Graphics
TIFF	Tagged Image File Format
UPS	Universal Polar Stereographic
USRP	UTM Standard Raster Product
UTM	Universal Transverse Mercator
VPF	Vector Product Format
WGS-84	World Geodetic System 1984